

This listing of claims replaces all prior versions, and listings of claims in the instant application:

Listing of Claims:

1. (Currently amended) A semiconductor die package, comprising:

a substrate having a first and a second surface;

a die having a first surface and a second surface, wherein the first surface of the die is attached to the first surface of the substrate;

a heat spreader attached to the second surface of the die, wherein the heat spreader comprises:

an interior planar portion overlying and attached to the die;

an outer planar portion overlying and attached to at least a portion of the substrate; and

a first angled portion extending from the outer planar portion towards the second surface of the die; and

an encapsulant completely enclosing the die and the heat spreader, ~~wherein the encapsulant covering an uppermost portion of the heat spreader is approximately 9 mils thick.~~

2. (Original) The die package of Claim 1, wherein the second surface of the die is the face containing active circuitry.

3. (Original) The die package of Claim 2, wherein the second surface of the die is electrically coupled to the first surface of the substrate.

4. (Previously presented) The die package of Claim 3, wherein bond wires electrically couple the second surface of the die to the first surface of the substrate.

5. (Original) The die package of Claim 1, further comprising a conductive ball grid array coupled to the second surface of the substrate.

6. (Previously presented) The die package of Claim 1, further comprising a thin layer of thermal conductive adhesive between the die and the heat spreader.

7. (Original) The die package of Claim 6, wherein the thin layer is of the order of approximately 1 mil or less.

8. (Currently amended) The die package of Claim 1, wherein the encapsulant covering ~~the~~ an uppermost portion of the heat spreader is no more than 9 mils thick.

9. (Canceled)

10. (Currently amended) The die package of Claim 9 1, wherein the outer planar portion only overlies portions of the substrate in a direction extending laterally from the four sides of the die.

11. (Currently amended) The die package of Claim 9 1, wherein the outer planar portion overlies substantially all of the substrate.

12. (Original) The die package of Claim 1, wherein the first surface of the die is the face containing active circuitry.

13. (Original) The die package of Claim 12, wherein the first surface of the die is electrically coupled to the first surface of the substrate.

14. (Previously presented) The die package of Claim 13, wherein an array of solder bumps electrically couple the first surface of the die to the first surface of the substrate.

15. (Currently amended) The die package of Claim 9 1, wherein a thin layer of encapsulant is located between the outer planar portion of the heat spreader and the first surface of the substrate.

16. (Currently amended) A ball grid array (BGA) package, comprising:

- a substrate including a ball grid array;
- a die coupled to the substrate;
- a thin thermal conductive adhesive layer on the die;
- a heat spreader attached to the die with the adhesive

layer, wherein the heat spreader comprises:

- an interior planar portion overlying and attached to the die;

- an outer planar portion overlying and attached to at least a portion of the substrate; and

- a first angled portion extending from the outer planar portion towards an upper surface of the die; and

- an encapsulant completely covering the heat spreader,
~~wherein the encapsulant covering an uppermost portion of the heat spreader is approximately 9 mils thick.~~

17. (Currently amended) The BGA package of Claim 16 wherein the encapsulant covering ~~the~~ an uppermost portion of the heat spreader is no more than 9 mils thick.

18. (Canceled)

19. (Currently amended) The BGA package of Claim ~~18~~ 16, wherein a thin layer of encapsulant is located between the outer planar portion of the heat spreader and the upper surface of the substrate.

20. (Currently amended) A method of dissipating heat from a ball grid array package, comprising:

attaching a die to a substrate including a ball grid array;

attaching a heat spreader directly to the die, wherein the heat spreader comprises:

an interior planar portion overlying and attached to the die;

an outer planar portion overlying and attached to at least a portion of the substrate; and

a first angled portion extending from the outer planar portion towards an upper surface of the die; and

encapsulating the die and the heat spreader completely, ~~wherein the encapsulant covering an uppermost portion of the heat spreader is approximately 9 mils thick.~~

21. (Canceled)

22. (Previously presented) The method of Claim 20, further comprising forming a thin layer of encapsulant between an outer portion of the heat spreader and a surface of the substrate.

23. (Currently amended) A method of packaging a semiconductor die, comprising:
providing a substrate;
attaching a first surface of the die to the substrate;
attaching a heat spreader directly to a second surface of the die, the second surface opposing the first surface, wherein the heat spreader comprises:

an interior planar portion overlying and attached to the die;

an outer planar portion overlying and attached to at least a portion of the substrate; and

a first angled portion extending from the outer planar portion towards the second surface of the die; and

completely covering the heat spreader with an encapsulant, ~~wherein a thickness of the encapsulant between an outer surface of the encapsulant and a closest portion of the heat spreader is approximately 9 mils.~~

24. (Previously presented) The die package of claim 1, wherein the heat spreader contacts the first surface of the substrate.

25. (Previously presented) The die package of claim 24, further comprising bond wires electrically coupling the second surface of the die to the substrate, wherein the heat spreader superimposes the bond wires.

26. (Previously presented) The die package of claim 2, further comprising bond wires electrically coupling the second surface of the die to the substrate, wherein the heat spreader superimposes the bond wires.

27. (Previously presented) The die package of claim 26, wherein the heat spreader contacts the substrate.

28. (Previously presented) The die package of claim 27, wherein the die has four peripheral sides, and the heat spreader contacts the substrate adjacent each of the four peripheral sides.

29. (Previously presented) The die package of claim 27, wherein the die has four peripheral sides, and the heat spreader contacts the substrate adjacent some but not all of the four peripheral sides.

30. (Previously presented) The die package of claim 1, wherein the second surface of the die includes bond pads electrically coupled to the substrate, and the heat spreader contacts the second surface of the die within a perimeter of the bond pads.

31. (Previously presented) The die package of claim 30, wherein the bond pads are each electrically coupled to the substrate by one of a plurality of bond wires, and the heat spreader superimposes the bond wires.

32. (Previously presented) The die package of claim 31, wherein the heat spreader contacts the substrate outward of a connection between the respective bond wires and the substrate.

33. (Previously presented) The die package of claim 31, wherein the heat spreader does not contact the substrate.

34. (Previously presented) The die package of claim 1, further comprising a metal ring coupled to the first surface of the substrate around the die and the heat spreader.

35. (Previously presented) The die package of claim 34, wherein the die is in a flip chip connection with the first surface of the substrate.

36. (Currently amended) The die package of claim 9 1, wherein the second surface of the die includes active circuitry, and bond pads electrically coupled to the substrate.

37. (Currently amended) A semiconductor die package, comprising:

a substrate having a first and a second surface;

a die having a first surface and a second surface, wherein the first surface of the die is attached to the first surface of the substrate;

a heat spreader attached to the second surface of the die, wherein the heat spreader comprises:

an interior planar portion overlying and attached to the die;

an outer planar portion overlying and attached to at least a portion of the substrate; and

a first angled portion extending from the outer planar portion towards the second surface of the die; and

~~an encapsulant completely enclosing the die and the heat spreader, wherein a thickness of the encapsulant between an outer surface of the encapsulant and a closest portion of the heat spreader is no more than 9 mils.~~

38. (Previously presented) The BGA package of claim 16, wherein the die includes an active surface with bond pads thereon, the heat spreader is attached to the active surface within a perimeter of the bond pads.

39. (Previously presented) The BGA package of claim 38, wherein the bond pads are electrically coupled to the substrate using bond wires, and the heat spreader arches over the bond wires.

40. (Previously presented) The BGA package of claim 39, wherein the heat spreader is attached to the substrate.

41. (Previously presented) The BGA package of claim 16, wherein the heat spreader includes a depressed region opposite a surface of the heat spreader that is attached to an active surface of the die, the depressed region being filled with the encapsulant.

42. (Currently amended) A ball grid array (BGA) package, comprising:

- a substrate including a ball grid array;
- a die coupled to the substrate;
- a thin thermal conductive adhesive layer on the die;
- a heat spreader attached to the die with the adhesive

layer, wherein the heat spreader comprises:

- an interior planar portion overlying and attached to the die;

- an outer planar portion overlying and attached to at least a portion of the substrate; and

- a first angled portion extending from the outer planar portion towards an upper surface of the die; and

an encapsulant completely covering the heat spreader,
~~wherein a thickness of the encapsulant between an outer surface
of the encapsulant and a closest portion of the heat spreader
is no more than 9 mils.~~

43. (Previously presented) The method of claim 20,
wherein the heat spreader is coupled to a surface of the die
that includes a plurality of bond pads, the bond pads being
electrically coupled to the substrate.

44. (Previously presented) The method of claim 23,
further comprising bond wires electrically coupling the second
surface of the die to the substrate, wherein the heat spreader
superimposes the bond wires.

45. (Previously presented) The method of claim 23,
wherein a thickness of the encapsulant between an outer surface
of the encapsulant and a closest portion of the heat spreader
is no more than 9 mils.

46. (Previously presented) The method of claim 45,
wherein a plurality of bond wires are electrically coupled to
the second surface of the die, and the heat spreader
superimposes the bond wires.

47. (Previously presented) The method of claim 46,
wherein a plurality of bond wires are electrically coupled to
the second surface of the die, the heat spreader superimposes
the bond wires, and the heat spreader is attached to the
substrate.

48-49. (Canceled)

50. (New) The die package of Claim 1, wherein the encapsulant covering an uppermost portion of the heat spreader is approximately 9 mils thick.

51. (New) The BGA package of Claim 16, wherein the encapsulant covering an uppermost portion of the heat spreader is approximately 9 mils thick.

52. (New) The method of Claim 20, wherein the encapsulant covering an uppermost portion of the heat spreader is approximately 9 mils thick.

53. (New) The method of Claim 23, wherein a thickness of the encapsulant between an outer surface of the encapsulant and a closest portion of the heat spreader is approximately 9 mils.

54. (New) The die package of Claim 37, wherein a thickness of the encapsulant between an outer surface of the encapsulant and a closest portion of the heat spreader is no more than 9 mils.

55. (New) The BGA package of Claim 42, wherein a thickness of the encapsulant between an outer surface of the encapsulant and a closest portion of the heat spreader is no more than 9 mils.